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Ultra-small RFID p-Chips on the heads of entomological pins provide an automatic and durable means to track and label insect specimens

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Abstract

A new, ultra-small, light-activated microtransponder ("p-Chip") has been integrated into the heads of entomological pins to improve efficiency in collections management and research through radio frequency identification (RFID) of insect specimens. These specimens are typically small, fragile, numerous and especially difficult to track. Globally, the majority are not currently recorded in any database. The application of unique identifiers has previously proven time consuming and difficult. Permanent and integral to the specimen, each p-Chip transmits a unique serial number allowing tracking without contact and reducing the risk of damage to specimens and repetitive strain injuries (RSI) in curators. The p-Chips and the specimens they tag can be linked immediately to biodiversity web services and collections databases. Specimens can be rapidly assigned to groupings as they are sorted and their taxonomic identity refined; and accurately tracked through high throughput methods and analyses. Quite importantly, with the p-Chips, the profile of the pin head is unchanged, and there is no discernible tactile difference from standard entomological pins. We also describe how p-Chips can be retro-fitted to provide complete compendia of legacy samples.

Key words: Automation, management, collections, barcode, tracking, label, taxonomy, radio frequency identification

Introduction

Efficient maintenance and development of biological collections relies on the ability to quickly and accurately label and track specimens. This is especially so in disciplines that are fundamentally concerned with observations of occurrence, number, diversity and relationship such as taxonomy, systematics and ecology. So far, tractable machine readable methods for rapid and reliable tracking of entomological specimens have proven elusive. Here we describe how ultra-small RFID transponders may be integrated unobtrusively, without risk of damage to newly pinned or existing entomological specimens. We report very rapid *in situ* acquisition of specimen identifiers in a form that facilitates data linkage and automation.

Insects form the greatest proportion of the 2.5–3.0 billion biological specimens in the world's natural history collections (OECD, 1999), predominantly in the form of dried specimens on entomological pins (Vollmar et al., 2010). These pinned specimens and their associated metadata are the primary reference points (vouchers) for insect taxonomy and, as such, represent a global resource for understanding the identities and distributions of insects (Grytnes & Romdal, 2008). They also form an essential reference resource for high priority research, e.g. in agriculture, food security, disease control, climate change and the environment (Merriman, 2008; Pinto et al., 2010; Shaffer et al., 1998; Suarez & Tsutsui, 2004). Limited access to specimen information constrains productivity in these and other like fields. It limits the capacity to collect and collate information about insect taxa from collections

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